CHAPTER 2

The Systems Approach

OUTLINE

Classification of Foodservices
Foodservice Operations
The Nature of Foodservice Management
The Systems Concept and Approach
Types of Foodservice Systems
Summary
The systems approach to management is introduced in this chapter. This concept is based on the idea that complex organizations are made up of interdependent parts (subsystems) that interact in ways to achieve common goals. Application of the systems concept is made to foodservice organizations.

Managers face decisions about how to organize foodservice departments for the efficient procurement, production, distribution, and service of their food and meals. Many options are available based on the type of food purchased, where the food is prepared in relation to where it is served, the time span between preparation and service, and the amount and kind of personnel and equipment required.

Foodservices with similar characteristics are grouped as particular types of production or operating systems. Each of the four types of foodservice operating systems found in the United States today is described with its identifying features, advantages, and disadvantages. The typical foodservice organizations that use each type are also identified. This description should provide a basis for managers to decide on the type of operation suitable for a particular situation.

**KEY CONCEPTS**

1. The foodservice industry is vast and complex. The wide range of establishments in the industry may be classified into three major categories: commercial, institutional, and military. Each of these three may then be further categorized by specific type of operation.
2. The mission of a foodservice organization is the foundation on which all decisions should be made.
3. A system is a set of interdependent parts that work together to achieve a common goal. A foodservice organization is a system.
4. Systems theory evolved from earlier management theories such as scientific management, the human relations movement, and operations research and general science theory.
5. The four major types of foodservice operations in existence today are conventional, ready-prepared, commissary, and assembly/serve. These classifications are based on differences in location of preparation, amount of holding time and method of holding cooked food, the purchase form of the food, and labor and equipment required.

**CLASSIFICATION OF FOODSERVICES**

The foodservice industry is broad and encompasses a wide range of establishments. They may be classified into three major groups:

- Commercial (restaurants, supermarkets, convenience stores, delis, snack bars, and other retail food establishments)
• Noncommercial (sometimes called institutional or on-site)—business, educational, governmental or institutional organizations that operate their own foodservice
• Military

Scope of Service. Within each of these types of foodservice organizations, a broad scope of services is offered. The phrase scope of services in foodservice operations refers to the number and types of business units offered through individual foodservice operations. The scope is typically a mix of retail and non-revenue generating units. For example, food and nutrition departments in hospitals offer patient meal and nutrition services. Both of these are typically non-revenue generating units. These same departments, however, likely offer at least one retail unit. The most common of these is the employee/visitor cafeteria where prices may be set to generate revenue for the entire department. Other retail units include satellite cafes, food courts, coffee kiosks, and vending and catering services. (Figure 2.1 includes several examples of scopes of services for a variety of foodservice operations.)

It is important for a foodservice manager to recognize the scope of services offered by a foodservice to gain an appreciation for the complexity of the department. Knowledge of the scope will also help the manager understand the financial status of the department and the opportunities to contain cost or generate revenue. Menus, production methods and service styles will vary among the various units, which will in turn influence how each unit needs to be managed. Finally, the food manager must understand the needs of each unit to effectively allocate limited resources among the units during the budget planning process.

Also, within each of these groups there are myriad types of foodservice establishments; each of these establishments has its own objectives, goals, and type of organization and management. Although they may seem widely divergent, each is concerned with providing a foodservice to some segment of the public. There is a commonality among them that can be identified for the purpose of grouping them into specific types of foodservice operations.

FOODSERVICE OPERATIONS

The Nature of Foodservice Management

All organizations have a mission that evolves from their reason for existence. A written mission statement is rapidly becoming a common document for guiding organizational decision-making. To achieve this mission effectively, the organization must then develop specific targets or objectives. For example, a foodservice organization’s mission might be to satisfy customers by serving high-quality, nutritious food at reasonable prices while achieving a desired profit for the organization. The objectives in this case might be such benchmarks as percent of customers marking satisfied and above on a rating scale, increase in total sales and number of customers, number of “regular” customers, and net profit. It is the responsibility of management to achieve the organization’s objectives.

A generic definition of management is that it is the effective and efficient integration and coordination of resources to achieve the desired objectives of the organization. Managerial effectiveness may be measured by how well the organization
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Figure 2.1 Examples of scope of services of four foodservice organizations.

achieves its objectives over time. Efficiency, in contrast to effectiveness, is a measure of short-term objectives. If a foodservice paid $1 for a head of lettuce and used an entire head for an individual salad, we would surmise that a lot of lettuce was being wasted. This is a comparison of input of lettuce to output of one salad—an inefficient use of resources, a short-term measure. The effectiveness measure would be to produce a high-quality, nutritious salad at a reasonable price in order to satisfy potential customers and return a profit to the organization.

Of prime importance to any organization in this increasingly competitive world is how well it is able to adapt, reach its objectives, and serve its mission. Viewing the organization as a system is essential in this endeavor, as is choosing the correct production system for the particular needs or characteristics of the operation. Systems management will be discussed first followed by a section on production systems.
THE SYSTEMS CONCEPT AND APPROACH

Before discussing foodservice organizations as “systems,” this section reviews the systems concept and systems approach and how systems theory has evolved from other theories of management. This review establishes a common basis of understanding and makes application of the systems concept to foodservice an easy transition.

A Brief History of Systems Theory. Organizations are systems. This concept has evolved gradually from earlier theories of management. Traditional views in prominence in the late nineteenth and early twentieth centuries included the scientific management theory, which puts emphasis on efficient work performance. Workers were trained to perform a task in what was perceived to be the one best way. If all performed efficiently, the goals could be reached. Often referred to as the classical approach to management, the principles developed from this theory are still believed by most managers to be important to the success of modern organizations. These principles are listed and defined in Chapter 13.

In the late 1920s, research conducted by Elton Mayo and his associates at the Hawthorne Plant of the Western Electric Company led to the findings that social and psychological factors were critically important determinants of worker satisfaction and productivity. Thus, the human relations movement in industry began.

After World War II, quantitative methods began to be employed for the purposes of decision-making. The application of computer technology and mathematical models was collectively called operations research or management science.

All of these early theories of management were internally focused despite the work of several management theorists who described organizations as systems interrelated with their environments. During the 1960s and 1970s, as organizations faced ever more turbulent social, economic, and technological environments, a broadly strategic orientation to organizational management began to emerge: systems theory. This new approach placed a greater emphasis on the organization’s relationship with its environment and is based on the assumption that performance can be improved by aligning the mission and design of an organization with environmental constraints and demands.

This evolutionary process is graphically depicted in the triangular management model (Fig. 2.2). As shown in this model, current concerns for efficiency and productivity come from the classical management perspective; current concerns for organizational behavior and the important of human resources come from the behavioral management perspective; and current concerns for mathematical tools and measures come from the management science perspective.

At times called the open systems theory, it is based on a 1949 work by Ludwig von Bertalanffy in which he described the nature of biological and physical systems. Katz and Kahn’s groundbreaking classic, *The Social Psychology of Organizations*, published in 1966, paved the way for applying Bertalanffy’s general science systems approach to the management of organizations. Contributions of this work include the concepts of organizational “inputs” and “outputs” which encouraged managers to pay attention to economic, psychological, and sociological factors in their analysis of an organization; discouraging the one best way approach and recommending a contingency model in which factors in the environment help to
Figure 2.2 The triangular management model.

Dynamic equilibrium
Reacting to changes and forces, both internal and external, in ways that often create a new state of equilibrium and balance

Homeostasis
To remain the same and resist change

determine organizational design. In 1968 Churchman suggested that the systems approach is imperative for strategic management and should involve five key essential processes: identification of the organization’s fundamental values and goals and objectives that arise from them (desired outputs); assessment of the organization’s environment—forces outside the organization that may be opportunities or threats (environment); assessment of the organization’s resources and capabilities (inputs); identification of the organization’s structure (operations); and development of the management structure (management).

Some Basics of Systems Theory. Some foundational concepts underpin systems theory. They are:

- Organizations are “collections of parts” united by prescribed interactions, and designed for accomplishing specified objectives and goals.
- Organizations are highly complex entities in which attention must be paid to myriad inputs, processes, outputs, feedback loops, and the general environment under which the organization functions.
- Organizations operate within a society and, as such, they are interdependent and not self-contained.
- Organizations are ever-changing and constantly interact with the environment that changes them and they, in turn, change it.
- The organization cannot be understood as a function of its isolated parts because the behavior of the system doesn’t depend on what each part is doing, but on how each part is interacting with the rest.
- Organizations are not stable or unstable, but exist in a state of dynamic equilibrium that is necessary to maintain homeostasis.
The word **system** is used freely and in many different contexts. We read and speak of the solar system, defense system, transportation system, school system, and even of the human body as a system. A system has been defined in many ways and with so many different words that it may seem confusing. This commonality is found among systems: A system is a set of interdependent parts that work together to achieve a common goal. The interrelated parts are known as **subsystems**, each dependent on the others for achieving its goals. For example, a train cannot achieve its goal of transporting passengers from one destination to another if the wheels are off the track even though all parts of the train are in good working order. All elements must be coordinated to function together for success.

The initial premise of **systems theory** is that before applying any concept from the three major perspectives, the organization is viewed as an entity composed or made up of interdependent parts—the subsystems. Each subsystem contributes to the whole and receives something from the whole while working to achieve common goals. Management’s role is considered a “systematic endeavor,” one that recognizes the needs of all of the parts. Decisions are made in light of the overall effect of management on the organization as a whole and its objectives. This type of leadership is the systems approach, that is, an acceptance of the systems theory of management and the use of it as a style of managing. The recognition that a change made in one part of the system has an impact on all parts of the system is an example of the use of the systems approach. Three areas of common usage of this approach are:

- **Systems philosophy or thinking** is a way of thinking about phenomena in terms of wholes, including parts, components, or subsystems, with emphasis on their interrelationships.
- **Systems analysis** is a method for problem solving or decision-making.
- **Systems management** is the application of systems theory to managing organizational systems or subsystems.

**A Systems Model.** Various diagrams can be used to illustrate an organization as a system with its inputs, the subsystems that perform the operations, and the outputs, together with their interactions with the environment. One that is clear, simple, and easily adaptable to specific organizations is shown in Figure 2.3 and will be used throughout the book. At the end of each chapter the model and a systems question will be included.

**Some Key Systems Definitions.** Money, raw materials, time, equipment, energy (utilities), facilities, and personnel, together with the necessary information, are the **inputs** into the system. The work that is performed, known as **operations**, transforms the inputs (such as raw material into outputs (such as finished products or services). **Transformation** of these inputs into outputs takes place in the functional subsystems shown in Figure 2.4.

The **outputs** should be in line with the mission, goals, and objectives of the organization. The concept of **equifinality** means that outputs may be achieved in a variety of ways. A simple example of this would be good quality convenience products versus producing menu items from raw ingredients in-house. The outputs provide the information on how the operations worked or failed, or how they should be changed or modified. This information is known as **feedback** and provides management with data to initiate corrective measures to restore equilibrium.
Controls
The self-imposed plans and legal documents that impact the organization’s function

Management
The integration and coordination of resources to achieve the desired objectives of the organization

Memory
Records of past performance that assist in improving future effectiveness

Open system
A system that interacts with external forces in the environment

Controls like management and memory have an impact on all parts of the system. Management performs various functions in order to achieve the mission of the organization. Management will be discussed in more detail in Chapters 13-18. Memory is the systems term to include all records of past performance that may be used to improve future effectiveness.

An organization is also an open system that is influenced by and interacts regularly with external forces in its surrounding environment. On the model this is depicted with a permeable boundary around the internal organization components. These forces include various regulatory agencies, customers and other constituents, competitors, suppliers, social and economic conditions, and climate. These external forces affect practices within the organization, and, conversely, the organization has an effect on the forces in its environment. (For example, a hospital dietary department interacts with many external groups such as patients, customers, medical staff, hospital administration, and some regulatory agencies. The department, in turn, affects the external groups with which it interacts.) In contrast, a closed system does not interact with its environment. Most examples of closed systems would be mechanical in nature. All organizations are open systems, but some make the mistake of ignoring their environment or behaving as though it were not important.

The resulting outputs are ready-to-serve foods, clientele and personnel satisfaction, and financial accountability. Ideas generated from the results of operations are the feedback for use in improving the operation as necessary. All parts of the sys-

Figure 2.4 The functional subsystems of a traditional foodservice operation.

Figure 2.3 The organization as a system.
tem are linked by management functions, such as planning, organizing, and staffing, which are discussed in Part 5. To accomplish unification of the system, managers use various linking processes, such as communication and decision-making. Surrounding the system are environmental factors, such as regulatory agencies, the economy, social and cultural aspects, and the various constituents of the operation, such as customers and suppliers.

Change is constant and multidimensional. Change causes uncertainty and creates disorder or entropy in the organization. The organization must react to every change, force, or random disturbance, both internal and external, in ways that often create a new state of equilibrium and balance. These reactions are a series of modifications of equal size and opposite direction to those that created the disturbance—a dynamic or moving equilibrium. The goal of these modifications is to maintain the internal balances, or homeostasis. Systems must have homeostasis in order to have stability and survive. Homeostatic systems are ultra-stable in that everything in their internal, structural, and functional organization contributes to the maintenance of the organization.

Feedback of information from a point of operation and from the environment to a control center or centers can provide the data necessary to initiate corrective measures to restore equilibrium. Organizations and the world of which they are a part consist of a hierarchy of systems. Thus, a corporation is composed of divisions, departments, sections, and groups of individual employees. Also, the corporation is part of larger systems or suprasystems, such as all the firms in its industry, firms in its metropolitan area, and perhaps an association of many industries such as the National Restaurant Association (NRA) or the American Hospital Association. Interdependency is a key concept in systems theory. The elements of a system interact with one another and are interdependent. Generally, a change in one part of an organization affects other parts of that organization. Sometimes the interdependencies are not fully appreciated when changes are made. A change in organizational structure and workflow in one department may unexpectedly induce changes in departments that relate to the first department. Systems theory contains the doctrine that the whole of a structure or entity is more than the sum of its parts. This is called wholism. The cooperative, synergistic working together of members of a department or team often yields a total product that exceeds the sum of their individual contributions. Synergy is achieved when the various units of an organization share common goals.

Benefits of Systems Thinking. Research in management sciences has shown that organizations should be seen as systems much like people, plants, and animals. There are many benefits for managers who adopt a systems view of their organization. Systems theory helps organize a large body of information that might otherwise make little sense. The use of systems thinking aids in diagnosing the interactive relationships among task, technology, environment, and organizational members. In contrast to the classical models of organization, the systems approach has shown that managers operate in fluid, dynamic, and often ambiguous situations. The manager generally is not in full control of these situations. Managers must learn to shape actions and to make progress toward goals keeping in mind that the results achieved will be affected by many factors and forces.

Among specific benefits of the systems approach are the following:

- **More effective problem solving**: To effectively solve problems, it is imperative that the real causes of the problems be identified and addressed. Without an
understanding of the “big picture” of the organization, the focus on problem solving will tend to be only on the behavior or event and not on the system or structure that caused the problem to occur.

- **More effective communication**: Ongoing communication among all parts of the organization is critical for the success of any system. A clear understanding of the parts of the organization and how they relate to each other is required in order to know what to communicate and to whom.

- **More effective planning**: The planning process requires starting with the mission statement, objectives, and goals of the organization and determining what outputs will indicate that the desired results have been achieved, what processes will achieve these results, and what inputs are required to conduct these processes in the system.

- **More effective organizational development**: Effective organizational development requires a knowledge and application of the principles of strategic planning, leadership development, team building, change, and personnel management. A manager must have a good understanding of the overall systems in their organization including its major functions, departments, processes, teams, and individual employees in order to employ these various strategies in an effective manner.

## Types of Foodservice Systems

Those foodservices that operate in a similar manner, or with common elements, give the basis for grouping them into specific types of systems. Four major types of foodservice systems are in operation in the United States today. The systems differ in where the food is prepared in relation to where it is served, the time span between preparation and service, the forms of foods purchased, methods of holding prepared foods, and the amount and kind of labor and equipment required. These four types of foodservice systems are conventional, ready-prepared (cook/chill or cook/freeze), commissary (central production kitchen), and assembly/serve.

### Conventional

As the name implies, the **conventional system** has been used traditionally throughout the years. Menu items are prepared in a kitchen in the same facility where the meals are served and held a short time, either hot or cold, until serving time. In earlier years all preparation, as well as cooking, took place on the premises, and foods were prepared from basic ingredients. Kitchens included a butcher shop, a bakery, and vegetable preparation units.

Over the years a modified conventional system has evolved because of labor shortages, high labor costs, and the availability of new forms of food. To reduce time and labor costs, foodservice managers began to purchase some foods with “built-in” labor. Foods from butcher shops, in which meats were cut from prime cuts, and bakeshops are gone from most “conventional” kitchens today. Meats are now purchased ready to cook or portion controlled; bread and many bakery items are purchased from a commercial bakery or prepared from mixes; and produce is available in prewashed, pretrimmed, prepeeled, cut, frozen, or canned forms, all of which reduce the amount of production and labor required on the premises. Foods with varying degrees of processing are now used in conventional foodservice systems.
This system is most effective in situations and locales where the labor supply is adequate and of relatively low cost; where sources of food supplies, especially raw foods, are readily available; and when adequate space is allocated for foodservice equipment and activities.

Typical users of the conventional system are smaller foodservice operations such as independent restaurants, schools, colleges, hospital and health care facilities, homes for specialized groups, and in-plant employee feeding.

**Advantages.** The conventional system has many advantages. Quality control is considered of primary importance. Through the menus, recipes, and quality of ingredients selected by the manager, the foodservice achieves its individuality and standard of quality desired. It is not dependent on the availability and variety of frozen entrées and other menu items commercially prepared. This system is more adaptable to the regional, ethnic, and individual preferences of its customers than is possible with other systems. From an economic standpoint, greater flexibility is possible in making menu changes to take advantage of good market buys and seasonal fluctuations. Also, less freezer storage space is required than with the other systems, and distribution costs are minimal, both of which save on energy use and costs.

**Disadvantages.** The conventional system produces an uneven, somewhat stressful workday caused by meal period demands. Because the menu differs each day, the workloads vary, making it difficult for workers to achieve high productivity. Skilled workers may be assigned tasks that could be completed by nonskilled employees just to fill their time between meal periods. When three meals a day are served, two shifts of employees are required to cover the 12- to 15-hour or longer workday. Scheduling workers may be difficult with overlapping shifts.

**Rationale for Conventional Foodservice Systems.** Traditionally, effective foodservice administrators with conventional foodservice systems have utilized a skilled labor force for food production 13–14 hours per day. Given adequate food production equipment and available skilled labor, foods may be procured with limited amounts of processing. However, with constantly rising labor costs within the foodservice industry, the current trend in conventional foodservice systems is to procure more extensively processed foods.

**Ready-prepared (Cook/Chill or Cook/Freeze).** In the ready-prepared system, foods are prepared on the premises, then chilled or frozen and stored for use at some later time. Thus, foods are “ready,” prepared well in advance of the time needed. This is the distinct feature of ready-prepared foodservice systems—the separation between time of preparation and service. Unlike the commissary system, foods are prepared on site; however, the place of preparation is not the place of service. In addition, the food is not for immediate use as in the conventional system.

The cook/chill method can be accomplished in a variety of ways, but basically the food is prepared and cooked by conventional or other methods, then its temperature is brought down to 37°F in 90 minutes or less, and refrigerated for use at a later time. In one variation, prepared food is either pre-plated or put into bulk containers, such as hotel pans, chilled in a blast chiller (Fig. 2.5), stored in a refrigerator for up to five days, rethermalized (sometimes in carts such as that shown
Figure 2.5  A blast chiller used to bring bulk food from cooking temperature to 37° in 90 minutes or less. Courtesy of Burlodge USA.

in Fig. 2.6), and served. In another method, food items are prepared in kettles, pumped into special air- and water-tight plastic packages that hold 1.5 to 3 gallons, given an ice-water bath in a tumble chiller (Fig. 2.7), and stored in the refrigerator. Food items prepared by this method may be held for up to 45 days. Meat is prepared in this method by putting it in a large tank that automatically cooks the meat and then chills it in ice water as soon as the cooking cycle is over. Meats can then be refrigerated for up to 60 days.

In the **cook/freeze method**, a blast freezer or cryogenic freezing system must be available to freeze foods quickly and thus prevent cell damage. Foods for freezing may be pre-plated, but more often they are stored in bulk, which requires less freezer storage space.

Note that the ready-prepared entrees and vegetables undergo two heating periods: first, when foods are prepared and, second, after storage to reheat them for service to the consumer. Ready-prepared systems were developed to offset the critical shortage and high cost of skilled foodservice employees. Also it was seen as a way of evening out the workload from day to day and during each day because only certain menu items are prepared on any given day to build up an inventory for future use.

**Advantages.** The advantages of the ready-prepared system are related to reducing the “peaks and valleys” of workloads that may be found in the conventional system. Production scheduling to build up the menu item inventory can be on a 40-hour week, 8-hour day, without early morning and late evening shifts. Employee turnover is decreased and recruitment of new employees is enhanced by offering staff a more normal work week and reasonable hours.

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*Cook/freeze method*

Food production method in which food is prepared and cooked by conventional or other method, then frozen for use at a later time.
Other advantages are reductions in production labor costs, improved quality and quantity control by decreasing job stress related to production deadlines, and improved nutrient retention by decreasing time food is held within the serving temperature range. There can be a more balanced use of equipment when preparation is spread over 8 hours, rather than at mealtime only.

Management has close control over menu selections, the quality of ingredients, and portion size and quantity. This is not always true in other systems, especially with the assembly/serve system. Menu variety is potentially greater with this system, because many items can be prepared and stored for future use.

One advantage that the ready-prepared system has over the commissary system is the lack of worry about delivery from the central production kitchen. When foods are prepared and stored on the premises, menu items are available on call, and no waiting is involved.

**Disadvantages.** One disadvantage is the need for large cold storage and freezer units, which take space and add to energy costs. Depending on the method, a blast chiller or blast freezer is required, and they are expensive to purchase and operate. Control for food safety is especially essential with the cook/freeze method. Longree and Armbruster (1996) warn that “the production of precooked frozen foods must not ever be handled in a haphazard fashion; unless the freezing operation can be a continuous, streamlined, bacteriologically controlled, short-time process, the bacteriological hazards could be formidable.” (See Chapter 3 for more information on food safety.)

Because frozen foods are prone to structural and textural changes, extensive modifications in the recipe and ingredients are usually necessary to offset cell damage and to assure high-quality products.
Figure 2.7  One method of cook-chill food preparation using a pump fill station, tumbler-chiller, and cook-chill tank.

Courtesy of Chester-Jensen Co., Chester, PA.
Appropriate and adequate equipment for the rethermalization of foods prior to service is essential and can be costly. Microwave and convection ovens are the equipment usually used in service units located near the consumers.

Although ready-prepared systems have been used primarily by large-volume institutions and centralized commissary chain setups, such as health care units, employee feeding facilities, airlines, and correctional institutions, lower volume applications have begun to appear. Schools, supermarkets, fast-food companies, and large restaurants are now utilizing this technology.

**Rationale for Ready-prepared Foodservice Systems.** Mass-producing and freezing food may reduce labor expenditures by more effective use of labor in selected situations. Peak demands for labor may be removed because production is designed to meet future rather than daily needs. Furthermore, fewer skilled employees can be trained to heat and serve menu items, thus reducing the number of highly skilled workers required by the system. Food procurement in volume may decrease food costs for the system. A foodservice system based on ready-prepared products is contraindicated if additional expenditures for storage facilities, equipment, and food inventory cannot be absorbed by the organization.

**Commissary (Central Production Kitchen).** The commissary system is described as a large, central production kitchen with centralized food purchasing and delivery of prepared foods to service (satellite) units located in separate, remote areas for final preparation and service. This system was made possible by the development of large, sophisticated equipment for preparing and cooking large quantities of food from the raw, unprocessed state. Foodservice organizations with many serving units, sometimes widely separated as in a large city school system, sought ways to consolidate operations and reduce costs. The commissary system is the result.

Prepared foods may be stored frozen, chilled, or hot-held. Menu items may be distributed in any one of several forms: bulk hot, bulk cold, or frozen for reheating and portioning at the satellite serving units; or pre-portioned and pre-plated for service and chilled or frozen before delivery.

Typical users of this system are airline caterers, large city school systems, and franchised or chain restaurant organizations that provide food for their various outlets and vending companies.

**Advantages.** The commissary foodservice system can realize cost savings due to large-volume purchasing and reduced duplication of the labor and equipment that would be required if each serving unit prepared its own food. Some facilities where food is served may not have adequate space for a production kitchen, or the space can be better utilized for some other purpose. Quality control may be more effective and consistent with only one unit to supervise.

**Disadvantages.** Food safety and distribution of prepared foods may be concerns. There are many critical points in mass food production where contamination could occur. Employment of a food microbiologist or someone knowledgeable about safe techniques in mass food handling with specialized equipment is highly desirable, yet often costly.

Food must be loaded and transported in such a manner that it is maintained at the correct temperature for safety and is of good quality and appearance when
received for service. This requires specialized equipment and trucks for delivery. Poor weather conditions, delivery truck breakdowns, or other such catastrophes can result in food arriving late, causing irritating delays in meal service.

Another disadvantage is the high cost of purchase, maintenance, and repair of the sophisticated and specialized equipment needed for this type of production and distribution.

Rationale for Commissary Foodservice Systems. The commissary foodservice principles have been adopted in systems where service areas are remote from, yet accessible to, the production center. This concept can be applied to reduce the duplication of production labor and equipment that occurs if production centers are located at each foodservice site. Space requirements at the service sites are minimized because limited production equipment is required. By centralizing food procurement and production, the economies of volume purchasing may be realized. Commissary foodservice concepts are employed to meet various operational objectives related to effective use of resources.

Assembly/Serve. The assembly/serve system requires no on-site food production. This has led to the use of the term “kitchenless kitchen.” Fully prepared foods are purchased and require only storage, final assembling, heating, and serving. Assembly/serve systems evolved with the development of a variety of high-quality frozen entrées and other food products that have appeared on the market in recent years. Also, foodservice managers confronted with high labor costs and few skilled employees turned to this system to relieve the labor situation. Often with this system, “single-use” disposable tableware is used, thus eliminating the need for a dishwashing unit.

With the availability of frozen entrées with a starch that are low in fat and sodium, some hospitals have begun to purchase these retail-size commercially prepared frozen entrées for their patient foodservice. They are then “popped out” onto the service plate and rethermalized with IQF (individually quick frozen) vegetables and served. These pop-out food items have resulted in the system being characterized as “pick, pack, pop, and pitch!” In addition to the regular production line items, some companies are willing to produce items according to individual purchaser’s recipes and specifications. In addition to frozen foods, assembly/serve systems are also beginning to use sous vide, which is a method of food production in which foods are precooked and vacuum packed. Rethermalization is accomplished by boiling the food in the vacuum packages in which they are stored.

The primary users of the assembly/serve system are hospitals, yet some health care institutions and restaurants also use it. Although foodservices of all classifications can use prepared entrée items, few have adopted them exclusively. Hotels and restaurants that employ unionized chefs can be prohibited from using frozen entrées.

Advantages. The foremost advantage of the assembly/serve system is the built-in labor savings. Fewer personnel are required, and they do not have to be highly skilled or experienced. Procurement costs are lower due to better portion control, less waste, reductions in purchasing time, and less pilferage. Equipment and space requirements are minimal, as are operating costs for gas, electricity, and water.

Disadvantages. The availability in some markets of a good selection of desired menu items or those that have regional appeal is limited. However, more and bet-
ter quality frozen entrées are becoming available. The higher cost of these prepared foods may not be offset by the labor savings realized. Managers must carefully weigh the overall cost of this system.

Another disadvantage may be the quality of available prepared products and customer acceptability. The proportion of protein food (meat, fish, seafood, etc.) to sauce or gravy in some menu items may not be adequate to meet the nutritional requirements of the clientele. For example, two ounces of protein are required in the school meal pattern in school foodservice programs. Many frozen entrées may contain much less than that. Evaluation of products under consideration for use in the assembly/serve system is essential.

A manager considering a change from another system to the assembly/serve system should carefully evaluate the change in amount and kind of equipment needed. It may be excessively high in cost and in energy consumption to operate the duplicate pieces of heating equipment. Additional freezer space required for storage of the inventory of frozen entrées may not be available or may be too costly to install. Recycling or disposal of the large quantities of packaging materials and single-use tableware, if used, must be part of the total concern.

**Rationale for Assembly/Serve Foodservice Systems.** Assuming a lack of skilled food production employees, and an available supply of highly processed, quality food products, an assembly/serve foodservice operation may achieve operational objectives to provide client satisfaction. Managerial decisions to adopt this form of foodservice system should consider the availability of these resources to the foodservice operation.

Each type of foodservice system has proved successful in providing acceptable quality food in specific organizations with the conditions described for each. However, foodservice managers attempting to decide on one system over another should undertake an extensive investigation and study before making any decisions. Among the factors to consider are cost comparisons, availability of foods in all forms, quality, and nutritional value of fully prepared items, customer needs and acceptability, equipment and space requirements, energy use as estimated by the amount and kinds of equipment needed for each system, and availability and cost of labor.

**Summary**

Today’s foodservice managers should view their organization as a system composed of various elements or subsystems that are united by a common goal and that are interdependent and interact so that the processes or functions involved produce outcomes to meet stated objectives. A foodservice system is an integrated program in which the procurement, storage, preparation and service of foods and beverages, and the equipment, methods (and personnel) required to accomplish these objectives are fully coordinated for minimum labor, optimum customer satisfaction, quality, and cost control.

The defining characteristic of a system is that it cannot be understood as a function of its isolated parts. The behavior of the system doesn’t depend on what each part is doing but on how each part is interacting with the other parts. And to
understand a system, one must first understand how it fits into the larger system of which it is a part.

The arrangement of subsystems, procurement, food preparation, delivery and service, and sanitation in varying ways is the basis for grouping foodservices into types of production systems, each with common elements and procedures. Four major types of foodservice production systems found in the United States are conventional, ready-prepared, commissary, and assembly/serve. An evaluation of the merits of each system based on its characteristics, advantages, and disadvantages should be made before any one is adopted for use in a specific foodservice organization. A summary of the major characteristics of each system is given in Table 2.1. A flowchart of the step-by-step processes of the four foodservice systems is shown in Figure 2.8.

Recent research studies on foodservice systems in relation to time and temperature effects on food quality have been summarized and reported in another North Central Research bulletin. These microbiological safety, nutrient retention, and sensory quality studies provide specific data useful to persons deciding on a system to install or to those contemplating a change in systems. Further investigations are needed to advance understanding of the interrelationships among food products, resources, processes, and management in foodservices and so improve food quality in foodservice establishments.

The vast and ever-changing foodservice industry continues to be shaped by socioeconomic changes, demographic shifts, and the varying food habits and desires of the American people. Foodservice managers must keep abreast of these conditions and adapt their operations to the changing times in order to be competitive and successful. For a complex system to endure is not enough. It must adapt itself to modifications of the environment and evolve. Otherwise, outside forces will disorganize and destroy it. The difficult, paradoxical question that confronts those in the foodservice industry is, How can a stable organization whose goal is to maintain itself and endure be able to change and evolve?

APPLICATION OF CHAPTER CONCEPTS: MADISON METROPOLITAN SCHOOL DISTRICT CASE STUDY

The foodservice department serving the MMSD is classified as a noncommercial foodservice, also referred to as institutional or, the more contemporary, on-site. The mission statement of the MMSD is “Good nutrition is a key to success for all.” The foodservice is based on the following core values:

- Serving students is our number one priority.
- Our customers are served with dignity and respect.
- Nutritionally balanced meals are offered daily.
- Teamwork and communication skills are essential ingredients to our daily operational performance.
- Maintaining fiscal integrity is vital.

The foodservice is a commissary foodservice system that prepares and distributes food to 50 schools within the City of Madison. Some examples of inputs include funding from the state and federal governments; raw materials; supplies; time; equipment; utilities; the physical plant; and personnel, transformed into outputs
Table 2.1 Summary of the characteristics of the four types of foodservice systems.

<table>
<thead>
<tr>
<th>Location of food preparation kitchen in relation to where served:</th>
<th>Conventional</th>
<th>Cook/Chill</th>
<th>Cook/Freeze</th>
<th>Commissary</th>
<th>Assembly/Serve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready Prepared</td>
<td>On premises where food is served</td>
<td>On premises where food is served</td>
<td>Central production kitchen in building separate from service units. Food transported to satellite serving units.</td>
<td>Off premises (commercially prepared foods are purchased)</td>
<td></td>
</tr>
<tr>
<td>Form of food purchased:</td>
<td>Raw; some convenience foods</td>
<td>Raw; some convenience foods</td>
<td>Primarily raw ingredients</td>
<td>All convenience and prepared foods—frozen, canned, dehydrated, or prepeeled fresh</td>
<td></td>
</tr>
<tr>
<td>Food procurement:</td>
<td>Purchase for its own unit</td>
<td>Purchase for its own unit</td>
<td>Centralized purchasing for all service units</td>
<td>Purchase for own use</td>
<td></td>
</tr>
<tr>
<td>Time span between preparation and service, and method of holding:</td>
<td>Food prepared for immediate service (may be held hot, or chilled for a few hours)</td>
<td>Food prepared and cooked then chilled and held for 1–3 days, or 45–60 days depending on the system</td>
<td>Food prepared and fast frozen; held for later use up to 3–4 months</td>
<td>Food prepared and may be (a) distributed to satellite units for immediate service, (b) chilled and either pre-plated or put into bulk, (c) chilled and frozen and stored for later use either pre-plated or in bulk</td>
<td></td>
</tr>
<tr>
<td>Type of System</td>
<td>Conventional</td>
<td>Cook/Chill</td>
<td>Cook/Freeze</td>
<td>Commissary</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------</td>
<td>------------</td>
<td>-------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Amount and kind of equipment required</td>
<td>All pre-preparation, cooking, and serving equipment.</td>
<td>One or more blanchers, blanching vats, and coolers required. Both skilled and unskilled employees needed.</td>
<td>Frozen food equipment, freezer and refrigerator space.</td>
<td>Suitable containers for packaging and delivery.</td>
<td>Suitable containers for packaging and delivery.</td>
</tr>
<tr>
<td>Typical foodservices using this:</td>
<td>Independent restaurants and cafes; hospitals and medical facilities; homes for specialized groups; in-plant; educational institutions; colleges and universities.</td>
<td>Large hospitals, some large colleges and universities.</td>
<td>Large hospitals, some large colleges and universities.</td>
<td>Large hospitals, some large colleges and universities.</td>
<td></td>
</tr>
<tr>
<td>Labor needs:</td>
<td>Skilled cooks and preparation workers as well as less skilled for pre-preparation and serving.</td>
<td>Fewer highly skilled cooks needed compared with conventional because of one or two items prepared per day.</td>
<td>Facilities and workers reprogrammed for various tasks.</td>
<td>Highly trained in food production in mass quantities. Food microbiologists to assure food safety. Employees must be able to operate highly specialized equipment.</td>
<td></td>
</tr>
<tr>
<td>Reheating equipment</td>
<td>Equipment for reheating as steamers, steam jacketed kettles, or convection or immersion heating.</td>
<td>Reheating equipment as microwave ovens or steamers.</td>
<td>Reheating equipment as steamers, steam jacketed kettles, or convection or immersion heating.</td>
<td>Reheating equipment as microwave ovens or steamers.</td>
<td></td>
</tr>
<tr>
<td>Typical employees:</td>
<td>Skilled cooks and preparation workers as well as less skilled for pre-preparation and serving.</td>
<td>Fewer highly skilled cooks needed compared with conventional because of one or two items prepared per day.</td>
<td>Facilities and workers reprogrammed for various tasks.</td>
<td>Highly trained in food production in mass quantities. Food microbiologists to assure food safety. Employees must be able to operate highly specialized equipment.</td>
<td></td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Conventional</th>
<th>Commissary</th>
<th>Ready-Prepared</th>
<th>Assembly/Serve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase raw basic foods and limited convenience items</td>
<td>Purchase raw basic foods for all units</td>
<td>Purchase raw basic foods and limited convenience items</td>
<td>Purchase fully prepared foods in frozen, canned, dehydrated form; salad ingredients pre-prepared</td>
</tr>
<tr>
<td>Receive goods</td>
<td>Receive goods</td>
<td>Receive goods</td>
<td>Receive goods</td>
</tr>
<tr>
<td>Store foods: Refrigerator at 40° or lower Drystores 65–70°F</td>
<td>Store foods Refrigerator at 40° or lower Drystores 65–70°F</td>
<td>Store foods Refrigerator at 40° or lower Drystores 65–70°F</td>
<td>Store in freezer, 0°F or refrigerator 40°F or lower until serving time.</td>
</tr>
<tr>
<td>Prepreparation: washing, sorting, peeling, cutting, etc.</td>
<td>Prepreparation: washing, sorting, peeling, cutting, etc.</td>
<td>Prepreparation: washing, sorting, peeling, cutting, etc.</td>
<td>(none required)</td>
</tr>
<tr>
<td>Preparation and cooking: small to large batch and short order</td>
<td>Large batch cookery</td>
<td>Large batch cookery</td>
<td>(none required)</td>
</tr>
<tr>
<td>Hold as appropriate until serving time</td>
<td>Portion and freeze or chill &amp; store OR bulk freeze or chill &amp; store OR hold hot Transport in appropriate temperature-controlled equipment to satellite serving units</td>
<td>Portion &amp; freeze or chill &amp; store OR bulk freeze or chill &amp; store OR hold hot. Transport in appropriate temperature controlled equipment to satellite serving units Store in freezer or refrigerator as appropriate for later use</td>
<td></td>
</tr>
<tr>
<td>Temper (thaw) frozen foods in refrigerator</td>
<td>Temper (thaw) frozen foods in refrigerator</td>
<td>Temper (thaw) frozen foods in refrigerator</td>
<td></td>
</tr>
<tr>
<td>Reheat as necessary and distribute OR distribute and reheat</td>
<td>Reheat as necessary &amp; distribute OR distribute &amp; reheat</td>
<td>Reheat as necessary &amp; distribute OR distribute &amp; reheat</td>
<td></td>
</tr>
<tr>
<td>Assemble and serve</td>
<td>Assemble and serve</td>
<td>Assemble and serve</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 2.8** The step-by-step processes of the four foodservice systems.
such as meals, à la carte items, and products for catered events. Feedback from students, parents, administration, teachers, staff, and the community is used to identify opportunities to improve food quality and service.

### Critical Thinking Questions

1. Draw a systems model of the Madison Metropolitan School District foodservice operation.
2. Discuss how the MMSD foodservice might be a commissary system utilizing either ready-prepared or assembly/serve food production methods.
3. What are the food safety issues that must be taken into careful account in the commissary system? What procedures/controls need to be in place?
4. Create a hypothetical change in one of the subsystems of the MMSD foodservice, and describe how the change might impact each of the other subsystems.
5. Discuss why the MMSD foodservice is an open system by listing the many ways in which the operation would be impacted by and interact with its environment.
6. Based on the MMSD core values, write another possible mission statement for this foodservice.

### Chapter Review Questions

1. Define the systems concept.
2. Compare and contrast the systems theory with the scientific management theory.
3. Diagram a foodservice organization as a system.
4. Compare and contrast the four major types of foodservice systems described.
5. Which foodservice system(s) should be considered in each of the following situations?
   a. High labor cost in the area
   b. Very low equipment budget
   c. Close quality control desired
   d. High food cost in the area

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